

REMARKS

Claims 1-16 are now pending in the application. The Examiner is respectfully requested to reconsider and withdraw the rejection(s) in view of the remarks contained herein.

REJECTION UNDER 35 U.S.C. § 103

Applicants traverse the rejection of Claims 1-16 under 35 U.S.C. § 103(a) as being unpatentable over Murty U.S. Pat. No. (4,544,868) in view of Heinkel (EP 1,071,200(corresponding to U.S. Patent No. 6,351,091)).

Regarding claim 1, the Examiner admits that Murty does not show teach or suggest a switching circuit or method that forces current sharing by turning off DC bus current to one phase after turning on DC bus current to a subsequent phase as required by claim 1.

Heinkel does not show, teach or suggest a control system including an inverter having a switching circuit for regulating the DC bus current to a fixed level. Rather, Heinkel discloses a pulse width modulated (PWM) inverter that repeatedly switches or pulse width modulates the DC bus current between 0 and a fixed level.

Heinkel is directed to the startup of a motor and not to the steady state operation of the motor. In particular, Heinkel teaches:

In start-up phase Ta, the amplitude of pulse-width ratio PWV continuously increases. Pulse-width ratio PWV indicates the ratio of pulse width to the period of the switching frequency of the PWM control signals, and the amplitude is therefore defined as PWV/PWM_{max} . After start-up phase Ta, the amplitude takes the value "1," if the amplitude is assigned to the rated operation of the motor at full load.

Therefore, the inverter does not include a switching circuit for regulating the DC bus current to a fixed level as set forth in claim 1. The inverter in Heinkel regulates or pulse width modulates the current between 0 and the fixed level during startup.

The ratio (labeled PWV) of the pulse width to the period of the switching frequency is shown in FIG. 4. Initially, the pulse width of a first phase is small compared to the switching frequency – in other words the ratio is at a minimum. The pulse width for successive periods of the switching frequency increases to a maximum for the first phase. At that point, the pulse width modulation for the next phase begins at a minimum value and the ratio for the first phase decreases.

In contrast, the inverter in the present invention switches from zero to a positive value for a first phase. The DC current is not pulse width modulated between zero and the DC value. Before turning off the first phase, a second phase is turned on from zero to a positive value. The next phase is not pulse width modulated either.

In combining the references, the Examiner states that “The advantage of combining the two [Heinkel and Murty] would provide a system without the use of a position sensor to assure, during start-up, a desired rotational direction without problems or issues.” Office Action at p. 3.

Applicants are not addressing the problem identified by the Examiner. Applicants have provided the overlap to reduce acoustic noise during the operation of the motor. Applicants invention does not address startup or rotor position sensing issues per se.

Regarding claim 12, the Examiner admits that Murty does not show teach or suggest a switching circuit or method that forces current sharing by turning off DC

bus current to one phase after turning on DC bus current to a subsequent phase as required by claim 12.

Heinkel does not show, teach or suggest a switching circuit or method that determines a fixed level for a DC bus current and regulating the DC bus current to the fixed level. As was described above, Heinkel uses pulse width modulation that repeatedly switches the bus current between zero and a fixed level.

For the foregoing reasons, Applicants respectfully assert that Claims 1 and 12 are in condition for allowance. The remaining claims are directly or indirectly dependent upon claims 1 and 12 and are therefore allowable for the same reasons.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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